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LM02/0621

EXAMINER

JONES, H

ART UNIT

PAPER NUMBER

2763

DATE MAILED:

06/21/00

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Office Action Summary

Application No.
09/045,041

Applicant(s)
Fujisawa

Examiner
Hugh Jones

Group Art Unit
2763



☒ Responsive to communication(s) filed on May 3, 2000

☒ This action is **FINAL**.

☐ Since this application is in condition for allowance except for formal matters, **prosecution as to the merits is closed** in accordance with the practice under *Ex parte Quayle*, 35 C.D. 11; 453 O.G. 213.

A shortened statutory period for response to this action is set to expire 3 month(s), or thirty days, whichever is longer, from the mailing date of this communication. Failure to respond within the period for response will cause the application to become abandoned. (35 U.S.C. § 133). Extensions of time may be obtained under the provisions of 37 CFR 1.136(a).

Disposition of Claim

☒ Claim(s) 9-45 is/are pending in the application

Of the above, claim(s) _____ is/are withdrawn from consideration

☐ Claim(s) _____ is/are allowed.

☒ Claim(s) 9-45 is/are rejected.

☐ Claim(s) _____ is/are objected to.

☐ Claims _____ are subject to restriction or election requirement.

Application Papers

☐ See the attached Notice of Draftsperson's Patent Drawing Review, PTO-948.

☒ The drawing(s) filed on Mar 20, 1998 is/are objected to by the Examiner.

☐ The proposed drawing correction, filed on _____ is ☐ approved ☐ disapproved.

☐ The specification is objected to by the Examiner.

☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

☒ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).

☒ All ☐ Some* ☒ None of the CERTIFIED copies of the priority documents have been

☒ received.

☐ received in Application No. (Series Code/Serial Number) _____

☐ received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

*Certified copies not received: _____

☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

Attachment(s)

☒ Notice of References Cited, PTO-892

☒ Information Disclosure Statement(s), PTO-1449, Paper No(s). 3

☐ Interview Summary, PTO-413

☐ Notice of Draftsperson's Patent Drawing Review, PTO-948

☐ Notice of Informal Patent Application, PTO-152

— SEE OFFICE ACTION ON THE FOLLOWING PAGES —

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DETAILED ACTION

Drawings

1. Figures 1-2 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). Applicant has admitted that the figures represent prior art. See specification, page 2.

Claim Rejections - 35 USC § 101

2. 35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

3. **Claims 9-45 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.** The limitations of claims 9-20 and 45 are directed to abstract ideas. There is no pre-processing or post-processing of real world data. The limitations of claims 21-32 and 33-44 are directed to *systems and apparatus, respectively, incorporating* algorithmic programs on a computer. However, a claim directed at execution requires further consideration. The mere fact that a hardware element is recited in a claim does not necessarily limit the claim to a specific machine. *Cf. In re Iwahashi*, 888 F.2d 1370, 1374-75, 12 USPQ2d 1908, 1911-12 (Fed. Cir. 1989), *cited with approval in Alappat*, 33 F.3d at 1544 n.24, 31 USPQ2d at 1558 n.24. If a product claim encompasses *any* and every computer implementation

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of a process, when read in light of the specification, it should be examined on the basis of the underlying process. Such a claim is recognized as such because it will:

- define the physical characteristics of the computer component exclusively as functions or steps to be performed on or by a computer, and
- encompass *any and every* product in the stated class (e.g., computer, computer-readable memory) *configured in any manner* to perform that process.

Thus, even if the program were being executed, but there was no pre-processing or post-processing of real world data, i.e., *the underlying process was non-statutory*, the claims would not be statutory. Applicant is attempting to claim a simulation without any connection to real world data.

4. Claims 9-45 are rejected under 35 U.S.C. 101 because the claimed invention is not supported by either a specific asserted utility or a well established utility.

5. Claims 9-45 also rejected under 35 U.S.C. 112, first paragraph. Specifically, since the claimed invention is not supported by either a asserted utility or a well established utility for the reasons set forth above, one skilled in the art clearly would not know how to use the claimed invention.

Claim Rejections - 35 USC § 112

6. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

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7. **Claims 9-45 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. *The claims are extremely difficult to interpret. For illustrative purposes, claims 9-20 are considered to exemplify all claims, as per these issues. Examples are provided for Representative - Representative is responsible for correcting all other or similar instances.***

8. The issue has to do with *compressing* and *integrating*. Examiner interprets Representative's remarks on pages 10-11 of paper # 7 to mean that equivalent partial circuits are combined or merged in some fashion. It is not clear how they are *combined* and if the *combining* itself causes problems. For example, how could two partial circuits, which presumably could be separated by other circuits, be combined or merged without affecting the actual as well as simulated behavior? Would the new entity create structural, functional and logical inconsistencies or problems when it is, presumably, integrated with the rest of the circuit?

9. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

10. *The claims are extremely difficult to interpret. For illustrative purposes, claims 9-20 are considered to exemplify all claims, as per these issues. Examples are provided for Representative - Representative is responsible for correcting all other or similar instances.*

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11. Claims 9-45 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Note the following *examples*:

- claim 1: *extracting* how?
- claim 1: what *circuit*?
- claim 1: *inspect* how?
- claim 1: are the partial circuits related in any way (such as proximity, or does it matter)?
- claim 1: what *is configurations*? Does this mean physical and structural?
- claim 1: *exhibiting* how? How is this determined?
- claim 1: what is *equivalent operational characteristics*?
- claim 1: what is *equivalent operational characteristics based on the configurations*?

What is the connection between the two (what does *based* mean?).

- claim 1: *compressed* how?
- claim 1: what kind of simulation?
- claim 1: what is meant by *integrating* and how is it carried out? Is this the same as merging equivalent circuit blocks (as in class/sub-class 716/3)?

- claim 1: Is the simulation carried out *after integration* or *after compression* by integrating (issue of grammar).

- claim 10: what is *connectional relationships*? This does not provide the reader with useful information.

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- claim 11: what is *inspecting* is based on the corresponding component elements? This does not provide the reader with useful information.

- claim 13: what is meant by *mutually consistent*?

- claim 14: what is meant by *mutually inconsistent*?

- claims 16-17: what is *intensity* and *intensity of the influence*?

- claim 18: *frequency of shifting* of what?

12. Claim 15 recites the limitation "*given terminals*" in line 3. There is insufficient antecedent basis for this limitation in the claim.

13. Claims 9-49 are rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential steps, such omission amounting to a gap between the steps. See MPEP § 2172.01. The omitted steps are:

- claim 1: where is the *compressing* step?

- claim 1: what is *equivalent operational characteristics* based on the *configurations*?

Based seems to imply a step.

- claim 1: how is the *compression* carried out? There appears to be a step missing which is related to *based*.

- claim 1: how is the *integration* carried out? There appears to be a step missing which is related to *based*.

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- claim 10: what is *inspecting* is based on the *connectional relationships*? This does not provide the reader with useful information. There appears to be a step missing which is related to *based*.

- claim 11: what is *inspecting* is based on the *corresponding component elements*? This does not provide the reader with useful information. There appears to be a step missing which is related to *based*.

- claims 13-14: *judging* how?

- claim 15: *assessing* how?

- claim 15: *tracing* how?

- claim 16: *based* on the intensity - based how?

14. Claim 15 is rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential structural cooperative relationships of elements, such omission amounting to a gap between the necessary structural connections. See MPEP § 2172.01.

The omitted structural cooperative relationships are: there is no description of the *linking*.

Claim Rejections - 35 USC § 102

15. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless --

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

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16. Claims 9-45 are rejected under 35 U.S.C. 102(b) as being clearly anticipated by Filseth.

Filseth discloses (abstract):

"The invention describes a method for expanding (flattening) hierarchical descriptions of electronic circuits into flat descriptions. The method is characterized by two processes: one which eliminates feed-through and implicit signals, and another which pre-plans the layout of the flattened data structure before flattening. The flattening process may then take advantage of a number of resulting efficiencies to operate more quickly than present flatteners."

Col. 1, line 12 to col. 2, line 15 disclose:

"Modern electronic systems are often designed with the assistance of electronic computer-aided-design tools, hereinafter referred to as ECAD tools. Typically, a user will capture a schematic diagram or other convenient form of circuit description on a display screen of an ECAD system using any of a number of interactive or automatic (e.g., module generators, silicon compilers, logic synthesizers) techniques widely known in the present art. As a part of the design process, a designer will typically capture and compile a design and then simulate it through the use of a logic simulator.

Complex logic circuits are customarily described hierarchically, but are simulated flat (or fully expanded). This means that if a module A in a user's design contains three instances of a submodule B, and submodule B contains two instances of another submodule C, the user will declare only two copies of submodule C in the process of capturing his design, but because of the implied replication in the user's design, the simulator will simulate six instances of submodule C for each instance of module A, since there are two instances of submodule C in each of the three instances of submodule B comprising module A. When such a circuit description is modified and re-simulated, a program must read the hierarchical description and produce a flat, or fully expanded, description of the hierarchical design before the simulation may be accomplished. A program that accomplishes this function is called a "linker" or "flattener". Hereinafter, the terms "link" and "flatten" will be used interchangeably. All modern ECAD systems include such a program, since a flat circuit description is too cumbersome for users to create directly, and a hierarchical description cannot easily be simulated directly, because the many different instances of the submodules of a hierarchy may be in different states during simulation and must be dealt with individually by the simulator.

Inputs to a linker generally consist of a set of circuit descriptions of different hierarchical levels or "modules" in a circuit. Each module description contains a list of submodules, internal wires (also called "signals" or "nets"), and I/O (input/output) pins. Each I/O pin of the module's submodules is connected to one of the module's internal wires. Some of those wires are in turn connected to I/O pins of the module itself. The details of these interconnections are also a part of the module description.

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In addition, the module description contains the name of the module, the name of each submodule, internal wire, and I/O pin the module comprises. Any module may itself be a submodule of another module; further illustrating the impact of hierarchy on a design.

These inputs to the linker may be either memory-resident data structures, or data structures contained in files on an on-line mass-storage device. Since it is a relatively trivial process to move data structures between files and memory, it will be assumed hereinafter without loss of generality that all linker inputs are memory-resident.

The output from a linker is a flattened, or expanded, description of the input circuit descriptions. It contains an explicit representation of every copy of every bottom-level submodule in the circuit design. The term "bottom-level submodule" refers to submodules at the bottom level of a circuit hierarchy for which no further expansion is possible, i.e., submodules which comprise no further submodules. Hereinafter, such bottom-level submodules will be referred to interchangeably as "primitives". Each primitive has I/O connections (pins) which are explicitly represented, but which may be replicated in multiple instances of the primitive. Connections between I/O pins of primitives may be made at a higher level of hierarchy where the details of the lower levels of circuit interconnection are not explicitly visible, but which do exist."

See, also: col. 2, line 16 to col. 6, line 55.

Claim Rejections - 35 USC § 103

17. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

18. **Claims 9-45 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shinsha et al. or Wang et al. or Kuehlmann et al..**

19. Shinsha et al. discloses (abstract):

"A logic design automation system examines correspondence relationship among sublogics in intermediate gate-level logic (containing neither physical design information nor manually optimized

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logic design information) produced from updated functional-level logic and current gate-level logic (containing the above information) to identify corresponding sublogics and non-corresponding sublogics of the gate-level logics with reference to primary input/output signals and input/output gates. For the corresponding sublogics, the corresponding sublogics of the current gate-level logic are selected, and for the non-corresponding sublogics, the non-corresponding sublogics of the intermediate gate-level logic are selected. The selected sublogics are combined to synthesize updated gate-level logic which preserved therein the physical design information and the manually optimized logic design information for portions of the current gate-level logic which need not be modified."

Col. 1, line 49 to col. 2, line 8 disclose:

"It is the object of the present invention to provide a novel method in a logic design automation system in which physical design information and manually optimized logic design information contained in portions of the current gate-level logic which need not be modified in updating the functional-level logic in the physical design phase are automatically succeeded to the updated gate-level logic.

In accordance with the present invention, in a logic design automation system for automatically synthesizing gate-level logic from functional-level logic, the method comprises the steps of synthesizing intermediate gate-level logic containing neither physical design information nor manually optimized logic design information from the updated functional-level logic when portions of the current functional-level logic corresponding to the current gate-level logic containing the above information are modified, identifying corresponding sublogics and non-corresponding sublogics which are common and not common to the current gate-level logic and the intermediate gate-level logic, respectively, and combining the corresponding sublogics of the current gate-level logic with the non-corresponding sublogics of the intermediate gate-level logic to synthesize updated gate-level logic preserving physical design information and manually optimized logic design information for portions of the current gate-level logic which need not be modified."

See, also: fig. 1-2, 6, 17; col. 5.

20. Wang et al. disclose, "*Restructuring binary decision diagrams based on functional equivalence.*" The abstract discloses:

"A method to restructure binary decision diagrams (BDDs) from a given input ordering to any other ordering is proposed. This technique is based on the concept of functional equivalence and BDDs structure equivalence. A transpositional operator is developed to implement the transformation. It is shown that this transformation is used to find a good input variable ordering for BDDs a good input

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partition for communication complexity based multilevel logic synthesis. Experimental results are presented.

Index Terms: Boolean functions; equivalence classes; communication complexity; logic design; multivalued logic; restructuring method; Boolean functions; binary decision diagrams; functional equivalence; transpositional operator; input variable ordering; input partition; communication complexity; multilevel logic synthesis"

See, also: page 261 (functional and structural equivalence checking, structure modification); fig. 2 (structural equivalence); page 263 (Equivalence class, transpositional operator and variable ordering of BDD).

21. Kuehlmann et al. discloses, "*Equivalence checking using cuts and heaps.*" See: abstract; col. 1, pahe 263 (structural and functional equivalence); section 3 (merging of equivalent vertices). Also note fig. 2.

22. (Shinsha et al. or Wang et al. or Kuehlmann et al.) teach all of the limitations, but they do not explicitly teach simulation *before* device fabrication in order to verify functional and behavioral circuit characteristics. It would have been obvious to one of ordinary skill in the art at the time of the invention to carry out such a simulation because this is standard engineering practice - it would be costly and time consuming to fabricate a circuit which did not perform according to design specifications.

Response to Arguments

23. Applicant's arguments filed 5/3/2000 have been fully considered but they are not persuasive.

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24. Representative's arguments (pp. 11-15, paper # 4) concerning the art rejections are moot in view of the new art rejections. However, Examiner notes that many of the argued features are not actually claimed (also, please the 112 rejections, above). For example, the matter disclosed on page 10 is simply not present in claim 45, for example.

25. Examiner would like to thank Representative for the description of one of the embodiments (page 10, paper # 4). This description indicates, to the Examiner, the possible existence of novel matter. However, this matter *has not been claimed*.

Conclusion

26. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

27. A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

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28. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dr. Hugh Jones whose telephone number is (703) 305-0023.

Dr. Hugh Jones

June 17, 2000



ERIC W. STAMBER
PRIMARY EXAMINER